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DEPARTMENT OF STATISTICS.

LAKE SUPERIOR COPPER REGION.

Long anterior to the advent of Europeans, the region around Lake Superior had been occupied by an industrious race of miners. The implements of their labors found in their excavations attest the fact; but the record of their history is lost, nor have any traditions or memorials of them been preserved by the races which succeeded.

The Jesuit Fathers in the latter part of the 17th century were the earliest explorers of this region. The first mining operations within historical times were commenced in 1771 by an enterprising Briton, named Henry, at the forks of the Ontonagon; but so distant was he from inhabitants, and so wild and unsettled the country, that he was soon compelled to suspend his labors.

In 1819, General Cass, accompanied by Mr. Schoolcraft, made a journey along the southern shore of the lake to the Mississippi; and in 1823, Major Long passed on the north side on his return from a scientific expedition to the Mississippi and St. Peter's rivers. The publication of the accounts of these expeditions attracted general attention to the mining resources of the region, and established the abundance of copper, confirming fully the reports of voyageurs and trappers who had painted in the most glowing terms the mineral wealth of the region, and which for more than two centuries had excited the wonder and admiration of the civilized world.

The first definite information of this country, however, was that furnished by Douglas Houghton, State Geologist of Michigan, who, in 1841, published an account of his observations in the form of an annual report to the Legislature. This eminent man, while prosecuting further geological explorations, was unfortunately drowned, near the Eagle River, on the 13th of October, 1845. But already mining operations had been re-commenced in the region, and explorers and adventurers were flocking to it from all quarters.

The Chippeways, the Indian occupants of Northern Michigan, ceded their lands to the United States in 1842. The field was thus cleared of all obstacles to agriculture or mining. In the summer of 1843 several miners crossed over the line from Wisconsin and selected numerous mineral tracts. These selections, many of which are now occupied by the most productive mines in the country, (at first three miles square, but afterwards reduced to one mile,) were leased by the War Department to applicants, in virtue of an act of Congress, made in reference to the *lead lands* of Illinois. These leases required that the lessees should work the mines with all diligence, and render to the government six per cent. of the whole amount of the ores and metal raised.

In the season of 1844, it having become generally known that the country was open to settlement, numerous persons visited the region, and the first mining operations were commenced. Discoveries of vast masses of native copper and of veins and deposits in the rock rapidly succeeded each other; and the "copper fever" soon spread to every part of the country. In 1845, the shores of Keweenaw Point were whitened with the tents of emigrants and explorers. No less than 377 leases were issued in this year. In 1846, the excitement reached its climax—companies were formed, stocks bought and sold (many not worth the paper on which they were printed), and the whole community was mad with the expectation of sudden wealth. But every such mania has its end. The bubble at length burst, and at the close of the year scarcely half a dozen companies, of the multitude that had been formed, were actually engaged in mining.

In 1847 (the issue of leases having been suspended in 1846 as unauthorized by law), Congress passed an act for the sale of the mineral lands, and for a geological survey of the district. The latter was entrusted to Messrs. Foster and Whitney, whose elaborate report to Congress, and the subsequent work of Mr. Whitney,* form the basis of the present ac-

* "Mineral Wealth of the United States."

count. In the meantime, while the survey was progressing, the companies at work having met with much success, new companies were formed, and the position and character of the really metalliferous rocks having been ascertained, confidence was gradually restored. On the publication of the survey and maps of the whole region in 1851, copper mining in the district had become established on a firm basis, and was receiving a rapid development.

Having thus given a sketch of the progress of events on the shores of the Great Northern lake, it will be proper to add a few words on the geological structure of this region; and the results which have been accomplished.

The basin of Lake Superior occupies for the most part a great synclinal trough. From each side of the lake the dip of the sandstone, which appears to form its bed, is towards the center. The opposite shores, sometimes 160 miles apart, however, are very different in character and appearances—the northern, with cliffs almost perpendicular and sometimes more than 1,000 feet high, presenting scenes of unrivalled grandeur; the southern comparatively low, only occasionally rising to a height exceeding 200 feet above the lake.

This difference in aspect is easily accounted for. On the east and north the sandstone has been worn away, leaving only the enduring granite and trappean rocks, which present a more stable barrier against the further encroachment of the lake. Only here and there limited patches of sedimentary rocks remain, where they are sheltered from the action of the waters, standing as outliers in small islands and along the coast, and behind Isle Royale.

The sandstone, however, appears along the entire southern shore from Sault Ste Marie to Fond du Lac, its continuity being interrupted in only a few points where the older rocks have been denuded. The trend of this shore is east and west; but about mid-distance from its extremities, its outline is broken by a projecting point of land which extends in a north-east direction for 60 or 70 miles. This is Keweenaw Point.

The sandstone of Lake Superior has been satisfactorily proved to be of the lower Silurian age, and probably the equivalent of the Potsdam sandstone, the lowest fossiliferous rock recognized in the United States. Above it from any point between the Sault and the Pictured Rocks, the upper members of the Silurian system crop out in succession, with a slight southerly dip. Along this portion of the lake shore the sandstone lies nearly horizontally, and is made up of rounded grains of quartzose sand, but slightly discolored by iron, and having but little coherence. Its thickness is from 300 to 400 feet. When it comes in contact with the azoic rocks, as near the Carp and Chocolate Rivers, it rests unconformably upon them. On Keweenaw Point, however, its disposition is entirely changed, being thicker, tilted up and associated with heavy beds of conglomerate and trap. On tracing the interior ranges, which approach the lake at the extremity of the Point, they are found to extend southwesterly a few miles distant from the lake, gradually diminishing in Wisconsin, and finally disappearing before reaching the Mississippi River.

These ranges form usually two, but sometimes three or more, parallel ridges, steep towards the south, with a moderate dip lakeward, and averaging about 500 feet in height above the lake. Along the line of elevation locally known as the "*Trap Range*," the copper mines of the southern shore are situated, the metalliferous belt occupying in Michigan a length of more than 120 miles and a breadth varying from two to six miles. In the more elevated and central portion of the range the rocks are mostly of the igneous class, intercalated with beds of conglomerate. Receding in either direction from the line of igneous action, the belts of trap become thinner, and the conglomerate predominant, and, again, the latter is succeeded by sandstone, with its normal characteristics.

There are certain varieties of trap, which are universally recognized in this region and which have a marked influence on the character of

the veins as they pass through them. These changes of character are most distinctly perceived in Isle Royale and Keweenaw Point. The two species predominant in Keweenaw Point are the amygdaloid and greenstone; only the first of which is productive. The richest veins are found in the rock which is neither too compact nor too soft and porous.

Native copper, for which this region is peculiarly noted, occurs in many veins, but usually in small masses which are found near the surface and have evidently resulted from the decomposition of the sulphurets. The veins of those rocks in which they are most productive carry exclusively *native* copper, with a small admixture of native silver, and there has been no change observed in this characteristic at any depth as yet reached. Where the trap is not distinctly bedded, it ceases to bear native metal, but contains sulphuret of copper, zinc, lead, etc. Thus in the southern range of Keweenaw Point, which appears to have been protruded at a late epoch, and to have tilted up the bedded trap and interstratified conglomerate which lies to the north, the veins bear only sulphuret, and on the north shore, where trap is most developed, they seem to be of the same imbedded character, and are traversed by the same minerals.

There are three heads under which the miners class the mineral produced, viz.: *mass*, *barrel* and *stamp*, according to the size of the pieces in which it occurs. These distinctions are also recognized in commerce. "Mass copper" is met with in veins sometimes 20 or 30 feet long; and this, having been detached by stopping away the rock, is cut up by chisels into pieces of such size that they can be conveniently handled and raised to the surface. As prepared for shipment the mass copper usually contains from 70 to 80 per cent. of fine metal and sometimes is wholly free from foreign matter, yielding from 90 to 95 per cent. when melted down in the furnace. "Barrel copper" includes the smaller pieces weighing usually a few pounds which are too large to go under the stamps and too small to be shipped loose.

When cleaned the usual yield of "barrel" is from 60 to 70 per cent. of metal. "Stamp copper" forms a large part of all the veins. The ore is prepared to go under the heads by being calcined and broken into small fragments; and when this roasting process is completed, it is ready for shipment. Care has to be taken that the heat is so regulated that no part of the metal is fused.

The Lake Superior mineral region naturally divides itself into four districts, each characterized by its geographical position, and by the mode of the occurrence of its minerals. These are—

1. Keweenaw Point District.
2. Portage Lake District.
3. Ontonagon District, and
4. Isle Royal District.

In this order the several districts will be described in the narrative which follows:

The *Keweenaw Point District* embraces a large number of mines, some extensively worked, and extends over a space of 36 miles in length and from two to three miles in breadth. Its geological features are strongly marked. The metaliferous trap extends through it east and west, and there are through nearly its whole extent two well defined ranges, known as the *Greenstone Range*, and the *Bohemian* or *Southern Range*. The former comprises a line of bluffs rising sharply from the valleys of Eagle and Montreal rivers, which drain the district and flow in opposite directions. The Greenstone Range is made up of compact crystalline trappean rocks. Its northern limits are not sharply defined, but southward, between this and the next inferior bed, there is a stratum of conglomerate accompanied by a thin deposit which seems to be a consolidated volcanic ash, and beneath these lies the great southern metaliferous belt. The bed of conglomerate, which, at the eastern end of the Point, is from 30 to 40 feet thick, gradually thins out, and finally disappears, while the crystalline and amygdaloid rocks remain as well defined as before. The bed between the conglomerate and greenstone often contains thin sheets and particles of copper, and the conglomerate itself is not without

frequent indications of the same metal. To the south of this belt of conglomerate, the amygdaloid extends from two to three miles, occupying the low grounds of the Eagle and Montreal valleys. On the north the greenstone occupies a width on the surface of a quarter to half a mile, and gradually becomes less crystalline and compact. At length, by an imperceptible change, the rock is found to have become amygdaloid, resembling that on the other side of the conglomerate. From the point where this change occurs, to the first belt of sandstone, is a space of a mile or more which is occupied by a variety of trappean beds, some of which are more or less metaliferous; but together they constitute the "northern metaliferous amygdaloid belt," in which several important mines are worked. Still further to the north is a series of alternating belts of amygdaloid and sandstone, varying from 50 to 500 feet in thickness, and these are again succeeded by a heavy belt of conglomerate which occupies an extent on the surface of nearly a mile. Beyond is still another bed of amygdaloid rock of about 1,500 feet in thickness, succeeded again by conglomerate, which forms the northern portion of the Point from its extremity to Agate Harbor.

The mines of Keweenaw Point, almost without exception, are worked on metaliferous deposits, which have all the characteristics of true veins. They cross the belts of rock nearly at right angles to the strike of the formation, and have in many instances been bored through both the igneous and aqueous formations from the southern amygdaloid belt across the greenstone, the northern metaliferous beds, and the alternating sandstone and conglomerate, to the lake shore. It has not yet, however, been ascertained that the same veins extend across the southern range, and there bear sulphurets. It seems probable, nevertheless, that such is the fact. In their passage through the different rocks the veins exhibit marked changes. In the conglomerate their *gangues* are mostly calcareous, and the copper usually concentrated into large masses, and in one instance black oxide has been found in this rock. In the true

copper-bearing rock the veins appear with a gangue made up of quartzose matter mixed with calcareous spar and the zeolitic minerals. The width of the productive veins is usually from a foot to three feet, but rarely hold these dimensions for a considerable distance. The wider the vein, however, the richer are its metallic contents. In all the district few faults interrupt the continuity of the series in the older rocks. The general parallelism of the productive bodies indeed is remarkable, and they do not have any tendency to unite with one another to form what the Cornish miners call "champion lodes." The dip of most of the veins is nearly perpendicular, no deviation of more than 8° or 10° occurring anywhere. The selvages are well marked, being separated from the wall-rock by a thin layer of red clay or flucan, and the walls themselves striated and polished.

The principal shipping places of Keweenaw Point District are Copper Harbor, Agate Harbor, Grand Marais Harbor, Eagle Harbor, Cat Harbor, Eagle River, etc., all on the south shore of Lake Superior, and in line from east to west.

The following table exhibits the locations of the principal companies preparing for, and that have been or are engaged in mining on the Point:

Titles of Companies.	Locations.			No. of Shares.	Chief Offices.
	T.	R.	S.		
Central.....	58	31	23	20,000	Pittsburg.
Clark.....	58	28	8	20,000	Montreal.
Connecticut....	58	30	16	10,000	New Haven.
Copper Falls....	58	31	14	10,000	Boston.
Eagle River....	58	31	29	10,000	Pittsburg.
Fulton.....	57	32	33	20,000	New York.
Garden City....	58	31	28	20,000	Chicago.
Meadow.....	58	31	20	—	—
Montreal.....	58	28	17	20,000	Montreal.
Native Copper..	58	30	10	10,000	Pittsburg.
New York and Michigan....	58	28	12	—	—
North American.	57	32	2	10,000	Pittsburg.
Northwest.....	58	30	15	10,000	Philadelp'a.
Northwestern..	58	31	24	9,000	Pittsburg.
Pittsburg and Boston.....	58	32	36	6,000	Pittsburg.
Phoenix.....	58	31	19	10,000	Boston.
Star.....	58	28	9	10,000	Cleveland.
Summit.....	58	30	19	15,000	Pittsburg.

—Of these the Copper Falls, North American

Northwest, Northwestern, Pittsburg and Boston, and Phoenix Companies, have either been successful or have fair promises of ultimate success; and in the following table are presented the approximate results of each (in the amount of mass, barrel and stamp rock reduced to fine copper), and given in tons of 2,000 pounds from the commencement of operations to the end of the year 1858:

Year.	Copper Falls.	North American.	North West.	North Western.	Pittsburg & Boston.	Phoenix Mines.	Total of all Workings.
1845.....	..	..	..	..	99	45	113
1846.....	..	..	..	..	189	56	263
1847.....	227	..	..	..	2063	..	2367
1848.....	113	..	..	..	5004	..	5123
1849.....	113	257	162	..	6436	..	6978
1850.....	22	956	978	..	3588	..	5444
1851.....	..	674	1472	..	4261	..	6619
1852.....	63	256	1359	..	4166	79	6969
1853.....	461	1263	1251	..	5368	17	8636
1854.....	512	1613	1127	242	6578	20	10275
1855.....	695	1967	1034	320	9371	34	14112
1856.....	..	..	..	614	11108	..	16883
1857.....	..	..	1097	..	10869	..	17076
1858.....	2061	254	..	..	12567	338	18024
Total.....	..	..	..	..	81675	..	117392

From the above table, then it appears that since the commencement of operations the mines of this district have yielded a total of 11,739.2 tons of fine copper. The value of this amount, estimated at the average of \$500 per ton, gives a cash equivalent of \$5,869,600.

Beyond the 32d range, in which are situated the Fulton, North American, and Pittsburg and Boston (or as the latter is commonly termed the "Cliff") mines, the distinction between the crystalline trap or greenstone, and the amygdaloid, which is so conspicuous a feature in Keweenaw Point, can no longer be traced. A marked change indeed takes place in the metaliferous deposits within a few miles,

and the mines of Portage Lake, which are next in geographical order being only about twelve miles distant, are quite different from those which have hitherto been described.

The "Portage Lake District" was mined as early as 1846, but it was not before 1852 that general attention was directed to its resources. The metal is here found not so much in regular veins as in other districts; but is disseminated mostly in small masses through certain metaliferous beds which run with the formation and differ very slightly in composition from the other trappean beds with which they are associated. These beds are neither broken up nor deranged in their course, and their metaliferous contents are more uniformly distributed through them than on the Ontonagon. In some instances the same bed has been distinctly traced for a mile or more by a line of ancient excavations, and wherever opened is found to contain copper disseminated through it. There are now at work in this region the following several companies:

Titles of Companies.	Locations.			No. of Shares.	Chief Offices.
Albion	55	34	36	20,000	New York.
Franklin	55	34	34	10,000	Boston.
Huron	54	34	2	20,000	Boston.
Isle Royale	54	34	1	20,000	Washington
Pewabic	55	34	32	20,000	Boston.
Portage	54	34	36	10,000	Detroit.
Quincy	55	34	26	15,000	Detroit.
Ripley	55	33	30	10,000	Boston.
Sheldon	55	34	36	10,000	Boston.

The following table gives the results of the operations of these companies, exhibiting, year by year, the yield of the most productive:

Year.	Isle Royale.	Pewabic Mine.	Portage Mine.	Quincy Mine.	Total of all Work'gs.
1853.....	9.4	..	3.3	..	12.7
1854.....	18.8	..	5.6	..	24.4
1855.....	163.4	11.7	28.7	6.8	226.9
1856.....	119.6	71.4	47.3	17.0	308.2
1857.....	162.2	146.8	82.7	75.4	495.6
1858.....	235.4	225.6	?	198.5	754.6
Total....	708.8	455.5	..	297.7	1,822.4

In 1858 the Franklin yielded 61.3 tons and the Huron 33.8.

Probably 10 per cent. may be added to the aggregate above shown, which would include

the amounts taken from the mines previous to any regular returns being made, (1846-1853), and also the amounts taken from the few mines which have been omitted in the list. This would give a total from the region of 2004.6 tons, which valued at \$500 per ton, would be worth in cash, \$1,002,300.

The "Ontonagon Region" takes its name from the principal river by which it is drained. This stream has three branches flowing respectively from the east, south and west, and uniting nearly at the same point, they cross the trap range at right angles to its course, furnishing a tolerable means of communication between the mines and the lake. The mines are situated on the trap range, and are worked on both sides of the river for a distance of 12 to 15 miles. Between these mines and those of Portage Lake, the interval is about 25 miles, and in all that distance there are few, if any, open workings. The trap range in that part of its course is much broken into small knobs, and is almost entirely concealed by drift. To the west the limits of the really valuable part of the range are not yet defined.

There is considerable difference both in the character of the rocks and the mode of occurrence of the cupriferous deposits when compared with those of Portage Lake and Keweenaw Point. The trappean rock is more developed, and epidote becomes a frequent associate both of the rock and the veins, almost always occurring where copper is found. West of the Ontonagon a large part is made up of a large reddish quartzose porphyry, which is non-metaliferous; and intercalated in the trap are frequent beds of conglomerate which are usually quite thin, and to the north, the trap range is flanked as in Keweenaw Point, by heavy beds of this rock. The copper occurs in four forms of deposit—indiscriminately scattered through beds of trap; in contact deposits, between the trap and sandstone or conglomerate; in seams or courses parallel with the bedding of the rocks, and having the nature of segregated veins; and in true veins coinciding in direction with the beds of rock, but dipping at a

different, and usually a greater angle, in the same direction with the formation.

The principal mines of the Ontonagon Region, with location, etc., are enumerated in the following tabular form:

Companies.	Locations.		No. of Shs.	Offices.
	T.	R. S.		
Adventure.....	51	38 35	10,000	Pittsburg.
Algomah.....	51	37 30	20,000	Cleveland
Aztec.....	51	37 31	....	Pittsburg.
Bohemian.....	51	38 34	20,000	Philadelph'a.
Clinton.....	49	41 17	20,000	Ontonagon.
Derby.....	49	41 19	20,000	New York.
Douglas Hough-				
ton.....	51	37 15	10,000	Detroit.
Evergreen Bluff.	50	38 6	20,000	Detroit
Fire-Steel River.	51	37 22	10,000	Pittsburg.
Flint-Steel R'r.	50	39 11	20,000	New York.
Forest.....	50	39 30	10,000	Boston.
Glen Falls.....	50	39 31	10,000	Boston.
Gogebio.....	49	42 22	15,000	Detroit.
Hudson.....	49	41 11	20,000	New York.
Indiana.....	51	30 21	20,000	Ontonagon.
Magnetic.....	49	42 25	....	Detroit.
Mass.....	50	38 6	....	Pittsburg.
Merchants'.....	51	38 35	20,000	Pittsburg.
Merryweather.....	48	42 9	20,000	Detroit.
Metropolitan.....	49	42 26	15,000	Detroit.
Minnesota.....	50	39 15	20,000	New York.
National.....	50	39 16	10,000	Pittsburg.
Nebraska.....	50	39 12	20,000	Detroit.
Norwich.....	49	41 11	20,000	New York.
Ohio.....	51	38 36	....	Cleveland.
Olgima.....	....	....	....	....
Ohio Trap.....	49	40 5	12,000	Pittsburg.
Peninsula.....	50	39 15	....	....
Ridge.....	51	38	351,000	Pittsburg.
Rockland.....	50	39	1120,000	New York.
Sharon.....	49	41 9	20,000	New York.
Shawmut.....	52	36 10	20,000	Boston.
Superior.....	50	39 14	10,000	New York,
Toltec Consoli-				
dated.....	51	30 25	20,000	Boston.
Victoria.....	....	....	....	....
West Minnesota.	50	39 17	20,000	New York.
What-Cheer....	51	37 16	20,000	Providence.
Windsor.....	49	41 12	20,000	New York.

The annual yield of the most productive of the above workings is shown in the annexed exhibit:

Year.	Adventure.	Minnesota.	Rockland.	Total of all Workings.
1848.....	..	4.8	..	4.8
1849.....	..	39.2	..	39.2
1850.....	..	77.3	..	80.7
1851.....	6.2	230.6	..	240.7
1852.....	14.6	390.1	..	416.9
1853.....	6.0	392.3	..	499.7
1854.....	11.6	572.2	16.1	1043.8
1855.....	31.6	1075.5	119.4	1631.9
1856.....	73.2	1392.8	177.5	1879.9
1857.....	123.8	1514.7	264.7	2126.7
1858.....	68.0	1505.7	181.2	2073.7
Total.....	335.0	7195.2	778.9	10,038.0

Valuing the aggregate produce of these mines at \$500 per ton, the total sum amounts to \$5,019,000.

The "Isle Royale Region" comprises the island so called. In many respects it is the counterpart of the South Shore regions. The ridges of trap traverse the island longitudinally, and this rock, with occasional intercalated belts of conglomerate, forms the whole island. The trap all belongs to the bedded class, and contains the same metaliferous products as Keweenaw Point. The strata have, however, a dip which is just the reverse of that of the rocks on the opposite side of the lake, and their mural faces are turned to the north. The most extravagant notions formerly prevailed with regard to the richness of the island in copper, and soon after the opening of the Lake Superior Region nearly the whole Surface was taken possession of by different companies, and operations were commenced at numerous points.

The metaliferous deposits, however, were found not to be generally of that persistent character as to be worthy of being worked, and the island was subsequently abandoned. Only two companies have left records of their operations—namely, the Siskawit, (T. 66, R. 34, S. 13), and the Pittsburg and Isle Royale, (T. 65, R. 36, S. 12), companies, which are represented in the following table:

	Siskawit Company.	Pittsburg & I. R. Co.	Total (tons.)
1849.....	15.8	1.7	17.5
1850.....	15.6	4.5	20.1
1851.....	18.7	..	18.7
1852.....	31.2	..	31.2
1853.....	14.4	6.2	20.6
Total	95.7	12.4	108.1

—making a total product in the years embraced 108.1 tons, or in money, \$54,050.

Having in the foregoing accounts given a rapid sketch of the several districts of the mining regions of the American shores of Lake Superior, the following statement will show the results of each year for each district, and the total production for the whole region:

Years.	Keweenaw Point.	Portage Lake.	Onton- agon.	Isle Royale.	Total (tons.)
1845...	11.3	..	..	..	11.3
1846...	25.3	..	..	..	25.3
1847...	236.7	..	..	..	236.7
1848...	512.3	..	4.8	..	517.1
1849...	697.8	..	39.2	17.5	754.5
1850...	544.4	..	80.6	20.1	645.2
1851...	661.9	..	240.7	18.7	921.3
1352...	598.9	..	416.9	31.2	1047.0
1853...	863.6	12.7	499.7	20.6	1396.6
1854...	1027.5	24.4	1043.8	..	2095.7
1855...	1411.2	226.9	1631.9	..	3370.0
1856...	1638.3	308.2	1897.9	..	3644.4
1857...	1707.6	495.6	2136.7	..	4399.9
1858...	1802.4	754.6	2073.7	..	4630.7
Total..	11,739.2	1,822.4	10,038.0	108.1	23,617.7
Total value of 23,617.7 tons, at \$500 per ton \$11,853,850					

No one can say that, on the whole, eminent success has not been attained. In the fourteen years embraced in the tables the annual product has increased from about 10 tons to nearly 5,000.

A survey of the tables will show that success has not been uniform. Few of the many companies that have been organized, and spent vast sums in explorations and works, have had any return for the capital invested, and many never will have. Yet each of these companies commenced operations under equally favorable auspices. The total product of the year 1858 was due in two-thirds of its amount to one or two companies in each of the districts on the southern shore of the lake—namely, the Pittsburg and Boston, (Cliff,) in Keweenaw Point; the Pewabic and Isle Royale, in Portage Lake, and the Minnesota in Ontonagon. To these are due 3223.4 tons out of the total of 4630.7 tons set down as the year's production.

Mr. Whitney, in his "Mineral Wealth of the United States," wrote up the statistics of this region to the end of 1853. From what data he had been able to collect, he estimated, up to that date the whole amount of money expended in the region at \$4,800,000, and the value of the copper produced at \$2,700,000. The amount of capital since spent, up to the 31st December, 1858, has probably been an equal sum, making a total of \$9,600,000, or in round numbers \$10,000,000. There are no attainable data to verify this estimate, but it is near

fore stated at \$11,853,850. At the date of the publication of Mr. Whitney's work only \$504,000 had been paid in the shape of dividends, and this only by two companies—the Minnesota and the Pittsburg and Boston—the former having divided \$90,000, and the latter \$414,000. Both have since sustained their regular distributions, and still occupy the first place in the market. Up to the end of 1858, the first company had divided \$630,000, being \$31 50 on each share, on which had been paid only \$3 50, and the latter \$900,000, or \$150 on each of the 6,000 shares issued by the company, for which only \$18 50 had been paid. But, on the whole, we may as well adopt the conclusion come to by Mr. Whitney, who, in his work, before referred to, sums up the position and prospects of the mines of the Lake Region with the following remarks :

“Of the capital thus invested in the country a considerable portion has been expended in opening mines, which may reasonably be expected to become profitable to the adventurers. A very considerable amount was, however, irrevocably sunk during the first years of speculation and foolish excitement. But even at the present very moderate prices of Lake Superior copper stock, their actual cash value exceeds the whole amount that has been expended therefor. The mines of this region have a character of permanence, and there can be little doubt that their product will go on regularly increasing, as it has done in the years since mining operations may be said to have fairly commenced.”

The trap range extends into Wisconsin, and has at various times been examined by the geologists of the United States Survey of that State, and by other explorers. The results of their examinations have not been favorable, and there are few veins of copper beyond the borders of Michigan which promise to become of value. The only company at present operating in this region is the Fond du Lac (T. 47. R. 13, S. 8), with 10,000 shares, and the office worked, and this company (the “Montreal,” with a capital of £300,000 in £5 shares) ap-

worked, and this company (the “Montreal,” with a capital of £300,000 in £5 shares) ap- of which is at Superior City. No shipments have as yet been made from the Wisconsin district.

On the north shores of Lake Superior and Lake Huron, within the territorial limits of Canada and the islands adjacent thereto, mining has at various times been carried on with varying success. The trappean rocks of the region lying behind Isle Royale, and which form lofty cliffs in the headlands and numerous islands of that vicinity, are apparently the counterpart of those of the northern range of Keweenaw Point. No workings are at present going on here; but from 1846 to 1849 a rich vein was worked on Spar Island and the mainland opposite at Prince's Bay. The mine, however, proved unremunerative, although it contained large quantities of native silver; and the high expectations of the stockholders were unfortunately destined to be entirely disappointed. A number of localities were also formerly worked on Michipicoten Island and on the northeast side of the lake. The Quebec and Lake Superior Mining Association commenced operations in 1846, at Pointe Aux Mines, Mica Bay, on a vein said to be two feet wide, and rich in grey sulphuret; but, after erecting furnaces and expending £30,000, it appears that there was little ore to smelt, and the works were abandoned. That there are copper deposits in these regions, however, is abundantly attested, and future efforts may be more successful.

The mines on the north shore of Lake Huron are in a formation consisting of white and often vitreous sandstone, or quartz rock, passing into a jasper conglomerate, and interstratified with heavy masses of trap. These are supposed to be of the same age as the copper-bearing rocks of Lake Superior, and the chief difference seems to be in the great amount of amygdaloid trap present in the former. In these mines the ores are entirely sulphurets, and principally copper pyrites associated with a gangue of quartz. The Bruce mine is the only one now actually

pears to have been eminently successful. The mine is situated about 50 miles below Sault Ste. Marie, and due north of the extremity of St. Joseph's Island. The vein was discovered in 1846, and is contained in a dark-colored horn-blende trap. There are several other companies located on the north side of the lake (Huron); and it is probable that the success of the Montreal company will lead to a general opening up of the undoubted resources of the mineral lands of this portion of the American continent.

The ores produced in the Canada mines are all, or mostly all, sent to Swansea for reduction. The total exports of ores and copper from Canada (probably all from the Bruce mine) since 1850 have been as follows:

	Ores. Tons.	Copper. Tons.	Official Value.
1850.....	272.16	62.44	\$36,583
1851.....	1349.82	122.80	86,756
1852.....	598.08	24.92	32,420
1853.....	1639.68	61.60	94,325
1854.....	1731.52	..	103,328
1855.....	1708.00	1.96	91,627
1856.....	1106.51	..	82,834
1857.....	2869.54	3.36	240,942
1858.....	2158.24	2.24	191,949
Total (9 years).....	13,433.45	279.32	\$960,764

The American ores are shipped from the various parts of the southern shore of Lake Superior, and find their way, via the Canal of Sault Ste. Marie, to the smelting establishments at Detroit, Cleveland and Pittsburg, and in a less amount to those at Bergen Point in the Lower Bay of New York, at New Haven, and at Boston, and also to those at Baltimore. The four latter, however, are chiefly supplied with ores from the Appalachian mines of Tennessee, Virginia, etc., and from foreign countries.

On a future occasion the statistics of the copper production of other parts of the Union, and also of the amounts of copper imported into the United States for smelting purposes, may form an interesting article for the columns of the "JOURNAL." On the first point, however, our information is fragmentary, and the dissemination and distance of the producing regions so wide, that it will be difficult to bring toge-

ther the material necessary to its elucidation. With regard to the importation of copper ores the returns are made annually by the Registrar of the Treasury in the tables of "Commerce and Navigation," and require only the labor of compilation to make them available.

PRODUCTION OF COPPER IN THE UNITED KINGDOM.

1. MINES, ORES RAISED AND FINE COPPER PRODUCED, 1856.

Localities.	Number of mines worked.	Tons* of ores raised.	Tons fine cop'r produced.
Cornwall.....	135	183,851	12,019
Devon.....	23	47,067	3,138
Cumberland.....	5	4,388	293
Anglesea.....	2	2,668	178
Caernarvon.....	2	1,752	117
Cardigan.....	6	182	12
Radnor.....	2	116	8
Total, England and Wales.....	175	240,044	15,765
Cork and Tipperary.....	4	7,382	775
Waterford, Wicklow, &c.....	7	5,599	517
Total, Ireland.....	11	12,981	1,292
Sundry Districts not included in the above.....	..	151,654	10,110
Total, United Kingdom.....	187	401,592	27,167
Value in £ stg.....		1,744,516	2,933,611
Value in dollars.....		8,722,580	14,918,055

2. RESULTS OF 1854, 1855 AND 1856 COMPARED.

	1854.	1855	1856.
Mines worked, No.....	151	165	187
Ores raised, tons.....	333,734	359,470	404,592
Metal produced, ".....	22,286	23,849	27,167
Value of ores.....	\$7,419,030	8,201,945	8,722,580
Value of metal.....	\$12,436,875	15,214,385	14,918,055

3. FINE COPPER PRODUCED, 1821-1856.

	Tons.		Tons.
1821.....	11,492	1839.....	16,425
1822.....	12,340	1840.....	14,582
1823.....	10,840	1841.....	14,092
1824.....	10,869	1842.....	15,218
1825.....	11,601	1843.....	14,927
1826.....	12,424	1844.....	16,620
1827.....	13,805	1845.....	16,668
1828.....	13,650	1846.....	16,732
1829.....	13,503	1847.....	15,433
1830.....	14,819	1848.....	16,486
1831.....	16,472	1849.....	15,232
1832.....	16,184	1850.....	16,464
1833.....	14,801	1851.....	16,016
1834.....	15,732	1852.....	18,629
1835.....	16,206	1853.....	19,429
1836.....	16,542	1854.....	22,286
1837.....	11,368	1855.....	23,819
1838.....	14,078	1856.....	27,167

* Tons of 2,000 lbs.